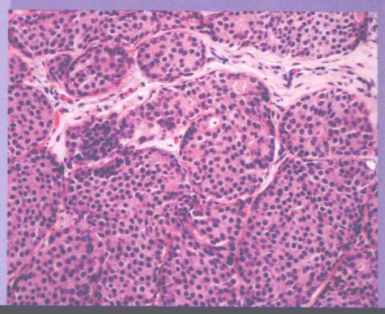
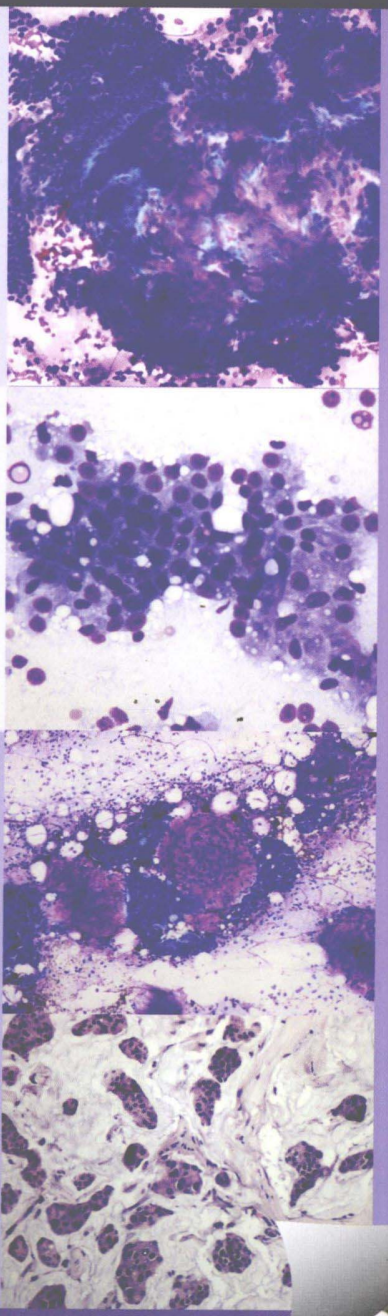


CYTOHISTOLOGY OF SMALL TISSUE SAMPLES

Published in association with the **Papanicolaou Society of Cytopathology**

Series Editors: **Kim Geisinger & Martha B. Pitman**

# Breast Cytohistology




**Edited by:**

**Joan Cangiarella**

**Aylin Simsir**

**Sana O. Tabbara**



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**Joan Cangiarella** is Interim Chair of Pathology, New York University School of Medicine, New York, USA.

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## BREAST CYTOHISTOLOGY

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# BREAST CYTOHISTOLOGY

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# CONTENTS

# 1 MINIMALLY INVASIVE BREAST BIOPSY: THE BREAST IMAGER'S PERSPECTIVE

*Jessica Torrente, Allison Yingling, and Rachel F. Brem*

## INTRODUCTION

Since the initial implementation of film-screen mammography in the 1970s as a screening exam for breast cancer, breast imaging has evolved by leaps and bounds. Today's breast imager utilizes multiple imaging modalities including full-field digital mammography (FFDM), ultrasound (US), and magnetic resonance imaging (MRI), and more recently, molecular imaging techniques including breast-specific gamma imaging (BSGI) and positron emission mammography (PEM) to aid in the evaluation of breast pathology. With these advances came the ability to diagnose smaller, non-palpable, and earlier-stage breast cancers. This carries with it the challenge of developing image-guided methods to provide a pathologic diagnosis in an accurate, cost-effective, and safe manner. The subsequent development of multi-modality techniques for minimally invasive, image-guided breast biopsy has largely occurred to help solve this diagnostic challenge.

The initial techniques for obtaining pathologic diagnoses of non-palpable, radiologic lesions included more invasive open surgical techniques, such as blind quadrantectomy or segmentomy. However, high rates of re-excision were reported. Therefore, the next development was preoperative internal needle and wire localization techniques, utilizing mammographic guidance. Wire-guided surgical breast biopsy was, until recently, the "gold standard" for the diagnosis of non-palpable radiographically detected breast lesions. However, this technique continued to be fraught with pitfalls, including inexact wire placement, dislodgement or fracture of placed wires, and a recovery rate of the radiographic abnormality anywhere from 2% to 20%.

However, one of the most consistent trends in medicine has been the steady strive to develop technology that allows physicians to accurately and safely diagnose and treat patients via ever less invasive methods. Breast imaging and intervention has undergone great changes over the past several decades, due to the development of image-guided minimally invasive technologies. These techniques are now available utilizing all traditional forms of breast imaging, including mammographic (stereotactic), US, MRI and most recently, nuclear medicine guidance to include BSGI and PEM.

## BREAST IMAGING REPORTING AND DATA SYSTEM (BI-RADS)

The Breast Imaging Reporting and Data System (BI-RADS) is a standardized imaging lexicon developed to facilitate the communication of results and recommendations between radiologists and referring clinicians and therefore the appropriate management of patients. Various groups, including the American College of Radiology, developed BI-RADS as a collaborative effort with the American College of Surgeons and the College of American Pathologists. Standard terminology is used to first describe and characterize mammographic findings and then the exam is coded as one of six categories of patient management (see Table 1.1). BI-RADS was initially developed for mammography, but now is used for all breast imaging modalities.

BI-RADS 1 and 2 examinations are normal or benign and yearly mammographic surveillance is recommended. BI-RADS 3 lesions are likely benign, meaning they have a less than 2% chance of malignancy. The appropriate management for a probably benign finding is a short interval follow-up. This is usually conducted in six-month intervals, for up to five years, to establish stability of lesions having a less than 2% likelihood of malignancy. The

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**Table 1.1:** BI-RADS

| *Code* | *Assessment* | *Management* |
|---|---|---|
| 0 | Incomplete | Additional work-up needed |
| 1 | Normal | Annual screening |
| 2 | Benign finding | Annual screening |
| 3 | Probably benign finding | Short interval follow-up |
| 4 | Suspicious abnormality | Biopsy recommended |
| 5 | Highly suggestive of malignancy | Appropriate action should be taken |
| 6 | Biopsy-proven cancer | Biopsy-proven, current cancer |

rationale behind the BI-RADS 3 category is to reduce false positive biopsy rates while maintaining an acceptably high rate of diagnosing favorable, early-stage breast cancers. Inclusion criteria for a probably benign mammographic assessment are (1) a circumscribed mass (at least 75% circumscribed margins) less than 1 cm, (2) round, punctate, or oval microcalcifications or microcalcifications that are more diffusely distributed or loosely clustered, and (3) a focal asymmetry. A focal asymmetry is a space-occupying lesion, seen on at least two mammographic projections. BI-RADS 4 exams contain abnormalities with a probability of malignancy from 2% to 95%, and BI-RADS 5 exams greater than 95%. Biopsy is indicated for lesions in both these categories. Some BI-RADS 3 lesions do undergo biopsy, usually in patients who are high-risk or high-anxiety. A BI-RADS 6 designation is used to denote an exam demonstrating a biopsy-proven cancer. This is most commonly used for patients undergoing subsequent post-diagnosis imaging evaluation, such as for preoperative planning or re-assessment following neoadjuvant chemotherapy. BI-RADS 0 means the imaging evaluation is incomplete and either additional images, including other imaging modalities, or comparison with previous examinations, are needed. Of note, a BI-RADS 0 categorization is temporary and final assessment requires a designation of BIRADS 1–6.

## STEREOTACTIC INTERVENTIONS

As mammography was the first examination used for the diagnosis of non-palpable breast cancers, it follows that this modality was the basis for image-guided biopsy of breast lesions. The minimally invasive biopsy of mammographic lesions employs stereotactic guidance, which today usually consists of microcalcifications. While masses can also be targeted and biopsied via stereotaxis, a large multicenter trial performed in 2003 found that 70% of stereotactic vacuum-assisted biopsy (VAB) was performed for suspicious microcalcifications. Microcalcifications worrisome for malignancy are clustered (five or more particles per cubic centimeter), pleomorphic (varying in size and shape), or have a worrisome mammographic distribution, such as segmental or ductal (Figure 1.1). Nine percent of VAB were performed on masses with microcalcifications and 19% on masses without microcalcifications. Masses worrisome for malignancy demonstrate angular or spiculated margins and may distort the adjacent breast parenchyma. Two percent of biopsies were performed on architectural distortions alone, a mammographic finding where there is no visible mass, but the breast parenchyma is radiating from a central nidus, likely due to a scirrhous reaction.

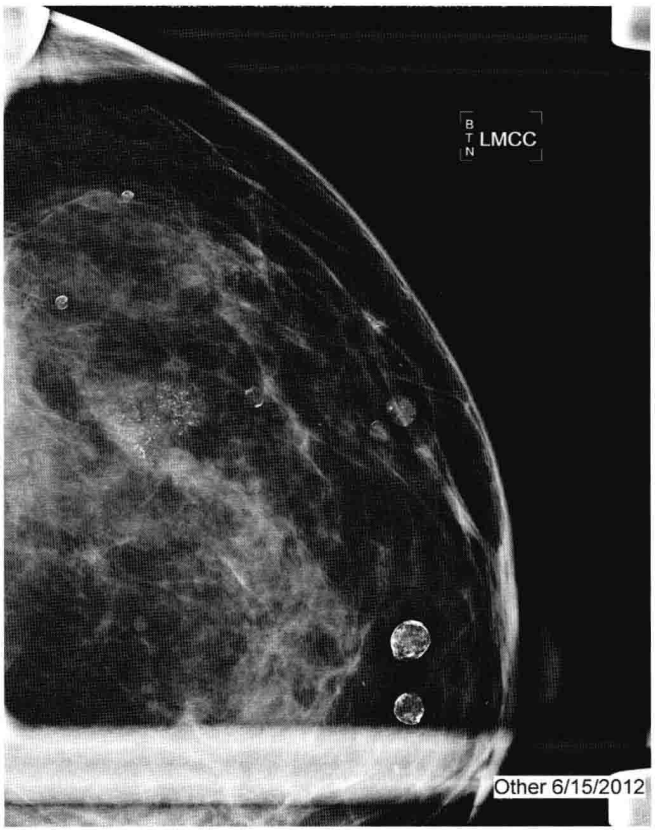


**Figure 1.1.** A craniocaudal spot magnification view demonstrates a large cluster of pleomorphic microcalcifications. Also seen are multiple coarse benign calcifications.

Commonly, stereotactic breast biopsies are performed on a dedicated prone table. However, when more efficient use of space is a priority, an attachment to an existing